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(54) ELECTROSTATIC CHARGE IMAGE DEVELOPING TONER AND ITS PRODUCTION

(57)Abstract:

PROBLEM TO BE SOLVED: To produce an electrostatic charge image developing toner in which an external additive is softly and uniformly fixed to the surface of color resin particles so as to realize stable image density and transfer characteristics for a long time in a multiple development and simultaneous transfer process capable of miniaturizing a device with good color registering.

SOLUTION: This toner is produced by adding fine particles to color particles comprising at least a resin and a coloring agent so as to fix the fine particles to the surface of the color particles. The fixing process is carried out under such conditions that the color particles and the fine particles are mixed in the presence of a mixing medium which is substantially sphere, that the temp. of the color particles (fixing temp.) during mixing is controlled to the range expressed by (T_g-20° C) (fixing temp.) (T_g+20° C), wherein T_g is the glass transition temp. (° C) of the resin, and that the mixing medium is removed after the treatment.

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This reference discloses image forming process comprising step of forming color images by overlapping all the toner images on the photoreceptor and transferring the overlapped toner images on the image recording media. The yellow, magenta, cyan and black toners used in the process for forming the color image have the same turbidity as shown in Table 6.

Attached translation

[0057]

[Example] Although an example is given and this invention is hereafter explained to details, the mode of this invention is not limited to this.

[0058] Example 1 [the example of coloring particle manufacture]

(Example 1 of coloring particle manufacture)

** A part Weight section Polyester resin (glass transition temperature = 57 degrees C) 100 Carbon black 10 Polypropylene The 2 above-mentioned components were kneaded, ground and classified, and the coloring particle with a volume mean particle diameter of 8.5 micrometers was obtained. Let this be "the black coloring particle 1."

[0059] (Example 2 of coloring particle manufacture) In the example 1 of coloring particle manufacture, the C.I. pigment yellow 17 was used instead of carbon black, and also the coloring particle was obtained similarly. Let this be "Y coloring particle 1."

[0060] (Example 3 of coloring particle manufacture) In the example 1 of coloring particle manufacture, the C.I. pigment red 122 was used instead of carbon black, and also the coloring particle was obtained similarly. Let this be "M coloring particle 1."

[0061] (Example 4 of coloring particle manufacture) In the example 1 of coloring particle manufacture, the C.I. pigment blue 15:3 was used instead of carbon black, and also the coloring particle was obtained similarly. Let this be "C coloring particle 1."

[0062] [The example of addition particle manufacture]

(Particle 1) In the methanol, to dry type silica (100nm of diameters of number average primary particle) 100g, hexamethyldisilazane 15g was cracked after 30-minute churning, filtration, and desiccation, and was produced to it.

[0063] (Particle 2) The dry type silica (15nm of diameters of a number average primary particle) was produced by the same method as a particle 1.

[0064] (Particle 3) About an amorphous titania (150nm of diameters of a number average primary particle), it is $\text{C}_{10}\text{H}_{21}\text{Si}(\text{OCH}_3)_3$ with the same method as a particle 1. It processed and produced using 10g.

[0065] (Particle 4) The amorphous titania (20nm of diameters of a number average primary particle) was produced by the same method as a particle 3.

[0066] (Particle 5) The methylmetaacrylate (MMA) particle (50nm of diameters of a number average primary particle) produced by the emulsion-polymerization method was used.

[0067] (Particle 6) The methylmetaacrylate (MMA) particle (1200nm of diameters of a number average primary particle) produced by the emulsion-polymerization method was used.

[0068] [Example of toner manufacture] Preliminary mixing of the above-mentioned coloring particle and the particle is carried out with the Mitsui Henschel mixer (FM-10B). So that the vibes low mill of drawing 1 with which it filled up with mixed data medium may be supplied continuously, warm water may be circulated in a jacket and the temperature in a toner exhaust port may turn into temperature shown below Moreover, fixed processing was performed, respectively on conditions as showed the path of used data medium, specific gravity, and a fill factor in "a table 1", it cooled by passing after that the mill which circulated cold water once again, collection recovery of the processing article was carried out, and the toner of this invention was obtained. Furthermore, as a comparison, fixed processing was performed also about the equipment of the impeller mold which does not use data medium. The condition and a result are shown in tables 1 and 2.

[0069]

[A table 1]

| トナー製造例 | 着色粒子 | 添加微粒子 | | 処理装置 | 処 理 条 件 | | | | 固定化度Fd (%) | 凝 集 物 |
|---------|--------|-------|----------------|------|-------------|-------------|----------------|--------------------|---------------|-------|
| | | 種 類 | 添 加 量 (重量%) | | 温 度 (°C) | 媒体径 (nm) | 媒体比重 (g/cf) | 媒体 : 着色粒子 (体積比) | | |
| 実 施 例 用 | 黒トナー-1 | 微粒子1 | 3.0 | 媒体型 | 70 | 2 | 2.0 | 1 : 2 | 80 | |
| | Yトナー-1 | 微粒子1 | 3.0 | 媒体型 | 70 | 2 | 2.0 | 1 : 2 | 82 | |
| | Mトナー-1 | 微粒子1 | 3.0 | 媒体型 | 70 | 2 | 2.0 | 1 : 2 | 83 | |
| | Cトナー-1 | 微粒子1 | 3.0 | 媒体型 | 70 | 2 | 2.0 | 1 : 2 | 81 | |
| | 黒トナー-2 | 微粒子1 | 4.0 | 媒体型 | 70 | 2 | 2.0 | 1 : 2 | 71 | |
| | Yトナー-2 | 微粒子1 | 4.0 | 媒体型 | 70 | 2 | 2.0 | 1 : 2 | 71 | |
| | Mトナー-2 | 微粒子1 | 4.0 | 媒体型 | 70 | 2 | 2.0 | 1 : 2 | 75 | |
| | Cトナー-2 | 微粒子1 | 4.0 | 媒体型 | 70 | 2 | 2.0 | 1 : 2 | 74 | |
| | 黒トナー-3 | 微粒子3 | 3.0 | 媒体型 | 65 | 2 | 2.0 | 1 : 2 | 74 | |
| | Yトナー-3 | 微粒子3 | 3.0 | 媒体型 | 65 | 2 | 2.0 | 1 : 2 | 75 | |
| | Mトナー-3 | 微粒子3 | 3.0 | 媒体型 | 65 | 2 | 2.0 | 1 : 2 | 73 | |
| | Cトナー-3 | 微粒子3 | 3.0 | 媒体型 | 65 | 2 | 2.0 | 1 : 2 | 74 | |
| | 黒トナー-4 | 微粒子3 | 3.0 | 媒体型 | 70 | 5 | 2.0 | 1 : 2 | 87 | |
| | Yトナー-4 | 微粒子3 | 3.0 | 媒体型 | 70 | 5 | 2.0 | 1 : 2 | 88 | |
| | Mトナー-4 | 微粒子3 | 3.0 | 媒体型 | 70 | 5 | 2.0 | 1 : 2 | 88 | |
| | Cトナー-4 | 微粒子3 | 3.0 | 媒体型 | 70 | 5 | 2.0 | 1 : 2 | 87 | |
| | 黒トナー-5 | 微粒子5 | 3.0 | 媒体型 | 70 | 2 | 4.0 | 1 : 2 | 90 | |
| | Yトナー-5 | 微粒子5 | 3.0 | 媒体型 | 70 | 2 | 4.0 | 1 : 2 | 90 | |
| | Mトナー-5 | 微粒子5 | 3.0 | 媒体型 | 70 | 2 | 4.0 | 1 : 2 | 90 | |
| | Cトナー-5 | 微粒子5 | 3.0 | 媒体型 | 70 | 2 | 4.0 | 1 : 2 | 90 | |
| | 黒トナー-6 | 微粒子5 | 3.0 | 媒体型 | 70 | 2 | 2.0 | 2 : 1 | 88 | |
| | Yトナー-6 | 微粒子5 | 3.0 | 媒体型 | 70 | 2 | 2.0 | 2 : 1 | 90 | |
| | Mトナー-6 | 微粒子5 | 3.0 | 媒体型 | 70 | 2 | 2.0 | 2 : 1 | 90 | |
| | Cトナー-6 | 微粒子5 | 3.0 | 媒体型 | 70 | 2 | 2.0 | 2 : 1 | 89 | |

[0070]

[A table 2]

| トナー製造例 | 着色粒子 | 添加微粒子 | | 処理装置 | 処 理 条 件 | | | | 固定化度Fd (%) | 凝 集 物 |
|---------|--------|-------|----------------|------|-------------|-------------|------------------------------|------------------|---------------|--------|
| | | 種 類 | 添 加 量 (重量%) | | 温 度 (°C) | 媒体径 (nm) | 媒体比重 (g/cm ³) | 媒体：着色粒子 (体積比) | | |
| 黒トナー-7 | 黒着色粒子1 | 微粒子1 | 3.0 | 攪拌翼型 | 70 | - | - | - | 85 | × (発生) |
| Yトナー-7 | Y着色粒子1 | 微粒子1 | 3.0 | 攪拌翼型 | 70 | - | - | - | 86 | × (発生) |
| Mトナー-7 | M着色粒子1 | 微粒子1 | 3.0 | 攪拌翼型 | 70 | - | - | - | 85 | × (発生) |
| Cトナー-7 | C着色粒子1 | 微粒子1 | 3.0 | 攪拌翼型 | 70 | - | - | - | 87 | × (発生) |
| 黒トナー-8 | 黒着色粒子1 | 微粒子5 | 3.0 | 攪拌翼型 | 83 | - | - | - | 融着発生 | × (発生) |
| Yトナー-8 | Y着色粒子1 | 微粒子5 | 3.0 | 攪拌翼型 | 83 | - | - | - | 融着発生 | × (発生) |
| Mトナー-8 | M着色粒子1 | 微粒子5 | 3.0 | 攪拌翼型 | 83 | - | - | - | 融着発生 | × (発生) |
| Cトナー-8 | C着色粒子1 | 微粒子5 | 3.0 | 攪拌翼型 | 83 | - | - | - | 融着発生 | × (発生) |
| 黒トナー-9 | 黒着色粒子1 | 微粒子5 | 3.0 | 媒体型 | 83 | 2 | 2.0 | 1:2 | 100 | |
| Yトナー-9 | Y着色粒子1 | 微粒子5 | 3.0 | 媒体型 | 83 | 2 | 2.0 | 1:2 | 100 | |
| Mトナー-9 | M着色粒子1 | 微粒子5 | 3.0 | 媒体型 | 83 | 2 | 2.0 | 1:2 | 100 | |
| Cトナー-9 | C着色粒子1 | 微粒子5 | 3.0 | 媒体型 | 83 | 2 | 2.0 | 1:2 | 100 | |
| 黒トナー-10 | 黒着色粒子1 | 微粒子6 | 3.0 | 媒体型 | 35 | 2 | 2.0 | 1:2 | 2 | |
| Yトナー-10 | Y着色粒子1 | 微粒子6 | 3.0 | 媒体型 | 35 | 2 | 2.0 | 1:2 | 1 | |
| Mトナー-10 | M着色粒子1 | 微粒子6 | 3.0 | 媒体型 | 35 | 2 | 2.0 | 1:2 | 1 | |
| Cトナー-10 | C着色粒子1 | 微粒子6 | 3.0 | 媒体型 | 35 | 2 | 2.0 | 1:2 | 2 | |

比 較 例 用

[0071] [System test]

(Manufacturing method of a carrier) On the surface of the Cu-Zn ferrite particle of 62 emu/g, the saturation magnetization when impressing specific gravity 5.0, the weighted mean particle size of 40

micrometers, and the external magnetic field of 1000 oersted produced the copolymer of a methylmethacrylate / styrene =6/4 presentation so that the average thickness of an enveloping layer might be set to 2.0 micrometers.

[0072] (Developer manufacturing method) The above-mentioned carrier 558g and toner 42g which neither an aggregate nor welding generated in a table 1 were mixed for 20 minutes under test environment (20 degree-C;50%R.H.) using the V shaped rotary mixer, and the developer of four colors of yellow (Y), a Magenta (M), cyanogen (C), and black was produced, respectively.

[0073] <<evaluation equipment and condition>> Evaluation converted and used the Konica color copying machine Konica9028 of the non-contact development package imprint method collectively imprinted to a transfer paper, after piling up all the colors on the photo conductor. Conditions are conditions shown below. The laminating mold organic photo conductor was used as a photo conductor.

[0074] Photo conductor surface potential = -550VDC bias = -250VAC bias =****-p:-50 - -450V alternating electric field frequency = [1800HzDsd] = 300-micrometer press restraining force =10 gf/mm press specification-part material =SUS416 (product made from magnetic stainless steel) / diameter developer thickness of 3mm =150-micrometer developer support = [20mm<<evaluation criteria,] In the N.N. environmental condition (20 degree-C;50%R.H.), the method>> test performed 10000 on-the-spot photo evaluation, and evaluated scattering scattering of the development nature and imprint nature after the first stage and 10000-sheet copy, a fluidity, a white muscle; a drum blemish, and a toner inside the plane. Moreover, about evaluation of the imprint nature of a superposition color, the developer of four colors was developed on the photo conductor in order of Y, M, C, and black, and the imprint nature was evaluated.

[0075] (1) Development nature original concentration 1.3 The patch of 2.0cmx5.0cm was developed and the amount of development toners per two was computed 1cm.

[0076] (2) It measured like imprint nature development nature measurement by the ratio of the imprint object top toner to the total amount of development.

[0077] (3) a color toner superposition color imprint — a sexual feeling — the toner was piled up and developed in order of Y, M, C, and black on phaosome, and viewing estimated the superposition color when imprinting this on an imprint object (O(good) ->*->x (wrong)).

[0078] (4) ***** of a fluid toner was measured using a Kawakita style ***** measuring device. Moreover, toner supply nature under system test was evaluated.

[0079] (5) It evaluated by carrying out macro-scopic observation of the white muscle on-the-spot photo image. This serves as evaluation of the image defect by formation of the floc of a toner and a balking external additive.

[0080] (6) The same method as a drum blemish (5) estimated the vertical reinforcement of an image. This serves as evaluation of the image defect by formation of the blemish of drum lifting.

[0081] (7) Viewing estimated the condition of the contamination inside the plane after toner scattering 10000 copy (O(good) ->*->x (wrong)).

[0082] <<evaluation result>> It carried out by producing a developer with the toner which neither an aggregate nor welding generated while the above-mentioned evaluation was shown in a table 1. The result is shown in a table 3.

[0083]

[A table 3]

coloring particle 1."

[0086] (Example 2 of coloring particle manufacture) In the example 1 of coloring particle manufacture, the C.I. pigment yellow 17 was used instead of carbon black, and also the coloring particle was obtained similarly. Let this be "Y coloring particle 1."

[0087] (Example 3 of coloring particle manufacture) In the example 1 of coloring particle manufacture, the C.I. pigment red 122 was used instead of carbon black, and also the coloring particle was obtained similarly. Let this be "M coloring particle 1."

[0088] (Example 4 of coloring particle manufacture) In the example 1 of coloring particle manufacture, the C.I. pigment blue 15:3 was used instead of carbon black, and also the coloring particle was obtained similarly. Let this be "C coloring particle 1."

[0089] [The example of addition particle manufacture]

(Particle 1) In the methanol, to dry type silica (100nm of diameters of number average primary particle) 100g, hexamethyldisilazane 15g was cracked after 30-minute churning, filtration, and desiccation, and was produced to it.

[0090] (Particle 2) The methylmetaacrylate particle (50nm of diameters of a number average primary particle) produced by the emulsion-polymerization method was used.

[0091] [Example of toner manufacture] After carrying out preliminary mixing of the above-mentioned coloring particle and the particle on the conditions shown in tables 4 and 5 using the Mitsui Henschel mixer (FM-10B), warm water was circulated in the jacket, various peripheral speed, time amount, and programming rates were changed to it, and the toner of this invention was obtained. The condition and a result are shown below. In addition, mixed data medium was not used especially in this example 2.

[0092]

[A table 4]

| | 評価 現像剤 | 評価トナー Fd (%) | | 現像性 (mg/cm ²) | | 転写性 (%) | | 流動性 静置密度 | け- 補給 不良 発生 割合 | 白筋 発生 割合 | 汚濁 発生 割合 | トナー 飛散 10000 コピー | カーボン 粒子の 転写性 |
|------------|-------------------|-----------------|-----|------------------------------|--------------|------------|--------------|-------------|----------------------------|----------------|----------------|---------------------------|--------------------|
| | | | | 初期 | 10000 コピー | 初期 | 10000 コピー | | | | | | |
| 実施例 1-1 | 現像剤 1-1 | 黒トナ-1 | 80 | 0.80 | 0.79 | 98 | 98 | 0.45 | - | - | - | ○ | ○ |
| | | Yトナ-1 | 82 | 0.82 | 0.81 | 99 | 98 | 0.43 | - | - | - | ○ | |
| | | Mトナ-1 | 83 | 0.81 | 0.81 | 98 | 99 | 0.44 | - | - | - | ○ | |
| | | Cトナ-1 | 81 | 0.79 | 0.79 | 99 | 98 | 0.45 | - | - | - | ○ | |
| 実施例 1-2 | 現像剤 1-2 | 黒トナ-2 | 71 | 0.78 | 0.75 | 98 | 97 | 0.43 | - | - | - | ○ | ○ |
| | | Yトナ-2 | 71 | 0.79 | 0.77 | 97 | 98 | 0.44 | - | - | - | ○ | |
| | | Mトナ-2 | 75 | 0.80 | 0.79 | 99 | 97 | 0.44 | - | - | - | ○ | |
| | | Cトナ-2 | 74 | 0.81 | 0.78 | 98 | 96 | 0.42 | - | - | - | ○ | |
| 実施例 1-3 | 現像剤 1-3 | 黒トナ-3 | 74 | 0.77 | 0.77 | 97 | 97 | 0.43 | - | - | - | ○ | ○ |
| | | Yトナ-3 | 75 | 0.80 | 0.80 | 99 | 99 | 0.45 | - | - | - | ○ | |
| | | Mトナ-3 | 73 | 0.80 | 0.81 | 98 | 97 | 0.45 | - | - | - | ○ | |
| | | Cトナ-3 | 74 | 0.79 | 0.78 | 98 | 98 | 0.44 | - | - | - | ○ | |
| 実施例 1-4 | 現像剤 1-4 | 黒トナ-4 | 87 | 0.78 | 0.41 | 97 | 95 | 0.45 | - | - | - | ○ | ○ |
| | | Yトナ-4 | 88 | 0.80 | 0.40 | 97 | 95 | 0.42 | - | - | - | ○ | |
| | | Mトナ-4 | 88 | 0.79 | 0.45 | 97 | 90 | 0.42 | - | - | - | ○ | |
| | | Cトナ-4 | 87 | 0.78 | 0.42 | 98 | 94 | 0.44 | - | - | - | ○ | |
| 実施例 1-5 | 現像剤 1-5 | 黒トナ-5 | 90 | 0.75 | 0.45 | 98 | 91 | 0.41 | - | - | - | ○ | ○ |
| | | Yトナ-5 | 90 | 0.76 | 0.41 | 99 | 90 | 0.40 | - | - | - | ○ | |
| | | Mトナ-5 | 90 | 0.80 | 0.40 | 98 | 97 | 0.42 | - | - | - | ○ | |
| | | Cトナ-5 | 90 | 0.74 | 0.48 | 97 | 95 | 0.41 | - | - | - | ○ | |
| 実施例 1-6 | 現像剤 1-6 | 黒トナ-6 | 88 | 0.65 | 0.70 | 97 | 96 | 0.41 | - | - | - | ○ | ○ |
| | | Yトナ-6 | 90 | 0.62 | 0.68 | 98 | 97 | 0.42 | - | - | - | ○ | |
| | | Mトナ-6 | 90 | 0.68 | 0.71 | 96 | 97 | 0.40 | - | - | - | ○ | |
| | | Cトナ-6 | 89 | 0.66 | 0.73 | 97 | 96 | 0.43 | - | - | - | ○ | |
| 比較例 1-1 | 比較用 現像剤 1-1 | 黒トナ-9 | 100 | 0.60 | 0.35 | 80 | 65 | 0.37 | 1500 | 7500 | - | ○ | × |
| | | Yトナ-9 | 100 | 0.61 | 0.35 | 77 | 62 | 0.35 | 1200 | 7000 | - | ○ | |
| | | Mトナ-9 | 100 | 0.58 | 0.32 | 81 | 66 | 0.35 | 1200 | 7600 | - | ○ | |
| | | Cトナ-9 | 100 | 0.55 | 0.31 | 79 | 62 | 0.37 | 1500 | 7500 | - | ○ | |
| 比較例 1-2 | 比較用 現像剤 1-2 | 黒トナ-10 | 2 | 0.71 | 0.70 | 81 | 60 | 0.35 | 1500 | 7800 | 7500 | × | × |
| | | Yトナ-10 | 1 | 0.70 | 0.70 | 80 | 59 | 0.36 | 1700 | 7500 | 1500 | △ | |
| | | Mトナ-10 | 1 | 0.74 | 0.69 | 79 | 55 | 0.34 | 1500 | 8000 | 5500 | × | |
| | | Cトナ-10 | 2 | 0.70 | 0.66 | 81 | 61 | 0.33 | 1200 | 8100 | 5000 | × | |

※ 比較用トナ-は固定化時に融着および凝集物の発生しなかったものについて評価した。

[0084] Any property is known by that the thing besides this invention has a problem in which property at least, and trouble is on practical use to what the thing in this invention does not have a problem in.

[0085] Example 2 [the example of coloring particle manufacture]

(Example 1 of coloring particle manufacture)

** Part Weight section Polyester resin (glass transition temperature = 57 degrees C) 100 Carbon black 10 Polypropylene The 2 above-mentioned components were kneaded, ground and classified, and the coloring particle with a volume mean particle diameter of 8.5 micrometers was obtained. Let this be "the black

| トナー製造例 | | 予 備 混 合 工 程 | | | 固 定 化 工 程 | | | | | |
|-------------|---------|--------------|------------|--------------|------------|------------------|--------------------|--------------|----------------|-------|
| | | 処 理 | 温 度 (℃) | 周 速 (m/s) | 温 度 (℃) | 保 持 時 間 (min) | 昇 温 速 度 (℃/min) | 周 速 (m/s) | 固 定 化 度 (%) | 凝 集 物 |
| 実 施 用 | トナー 1 Y | 有 | 20 | 40 | 70 | 20 | 4.0 | 20 | 75 | ○ |
| | トナー 1 M | 有 | 20 | 40 | 70 | 20 | 4.0 | 20 | 75 | ○ |
| | トナー 1 C | 有 | 20 | 40 | 70 | 20 | 4.0 | 20 | 75 | ○ |
| | トナー 1 K | 有 | 20 | 40 | 70 | 20 | 4.0 | 20 | 75 | ○ |
| | トナー 2 Y | 有 | 20 | 30 | 70 | 20 | 4.0 | 20 | 74 | ○ |
| | トナー 2 M | 有 | 20 | 30 | 70 | 20 | 4.0 | 20 | 74 | ○ |
| | トナー 2 C | 有 | 20 | 30 | 70 | 20 | 4.0 | 20 | 74 | ○ |
| | トナー 2 K | 有 | 20 | 30 | 70 | 20 | 4.0 | 20 | 74 | ○ |
| | トナー 3 Y | 有 | 25 | 40 | 70 | 20 | 4.0 | 20 | 76 | ○ |
| | トナー 3 M | 有 | 25 | 40 | 70 | 20 | 4.0 | 20 | 76 | ○ |
| | トナー 3 C | 有 | 25 | 40 | 70 | 20 | 4.0 | 20 | 76 | ○ |
| | トナー 3 K | 有 | 25 | 40 | 70 | 20 | 4.0 | 20 | 76 | ○ |
| | トナー 4 Y | 有 | 20 | 40 | 70 | 60 | 4.0 | 20 | 88 | ○ |
| | トナー 4 M | 有 | 20 | 40 | 70 | 60 | 4.0 | 20 | 88 | ○ |
| | トナー 4 C | 有 | 20 | 40 | 70 | 60 | 4.0 | 20 | 88 | ○ |
| | トナー 4 K | 有 | 20 | 40 | 70 | 60 | 4.0 | 20 | 88 | ○ |
| | トナー 5 Y | 有 | 20 | 40 | 70 | 20 | 1.0 | 20 | 73 | ○ |
| | トナー 5 M | 有 | 20 | 40 | 70 | 20 | 1.0 | 20 | 73 | ○ |
| | トナー 5 C | 有 | 20 | 40 | 70 | 20 | 1.0 | 20 | 73 | ○ |
| | トナー 5 K | 有 | 20 | 40 | 70 | 20 | 1.0 | 20 | 73 | ○ |
| | トナー 6 Y | 有 | 20 | 40 | 70 | 20 | 4.0 | 40 | 86 | ○ |
| | トナー 6 M | 有 | 20 | 40 | 70 | 20 | 4.0 | 40 | 86 | ○ |
| | トナー 6 C | 有 | 20 | 40 | 70 | 20 | 4.0 | 40 | 86 | ○ |
| | トナー 6 K | 有 | 20 | 40 | 70 | 20 | 4.0 | 40 | 86 | ○ |
| | トナー 7 Y | 有 | 20 | 20 | 70 | 20 | 4.0 | 20 | 73 | △ |
| | トナー 7 M | 有 | 20 | 20 | 70 | 20 | 4.0 | 20 | 73 | △ |
| | トナー 7 C | 有 | 20 | 20 | 70 | 20 | 4.0 | 20 | 73 | △ |
| | トナー 7 K | 有 | 20 | 20 | 70 | 20 | 4.0 | 20 | 73 | △ |
| | トナー 8 Y | 実施用トナー 1 に同じ | | | 70 | 80 | 4.0 | 20 | 90 | △ |
| | トナー 8 M | 実施用トナー 1 に同じ | | | 70 | 80 | 4.0 | 20 | 90 | △ |
| | トナー 8 C | 実施用トナー 1 に同じ | | | 70 | 80 | 4.0 | 20 | 90 | △ |
| | トナー 8 K | 実施用トナー 1 に同じ | | | 70 | 80 | 4.0 | 20 | 90 | △ |

[0093]

[A table 5]

| | | 予 備 混 合 工 程 | | | 固 定 化 工 程 | | | | | |
|-------------|---------|--------------|------------|--------------|------------|------------------|--------------------|--------------|----------------|-------|
| | | 処 理 | 温 度 (℃) | 周 速 (m/s) | 温 度 (℃) | 保 持 時 間 (min) | 昇 温 速 度 (℃/min) | 周 速 (m/s) | 固 定 化 度 (%) | 凝 集 物 |
| 比 較 用 | トナー 1 Y | 無 | — | — | 70 | 20 | 4.0 | 20 | 70 | × |
| | トナー 1 M | 無 | — | — | 70 | 20 | 4.0 | 20 | 70 | × |
| | トナー 1 C | 無 | — | — | 70 | 20 | 4.0 | 20 | 70 | × |
| | トナー 1 K | 無 | — | — | 70 | 20 | 4.0 | 20 | 70 | × |
| | トナー 2 Y | 有 | 45 | 40 | 70 | 20 | 4.0 | 20 | 91 | × |
| | トナー 2 M | 有 | 45 | 40 | 70 | 20 | 4.0 | 20 | 91 | × |
| | トナー 2 C | 有 | 45 | 40 | 70 | 20 | 4.0 | 20 | 91 | × |
| | トナー 2 K | 有 | 45 | 40 | 70 | 20 | 4.0 | 20 | 91 | × |
| | トナー 3 Y | 実施用トナー 1 に同じ | | | 70 | 0 | 4.0 | 20 | 22 | ○ |
| | トナー 3 M | 実施用トナー 1 に同じ | | | 70 | 0 | 4.0 | 20 | 22 | ○ |
| | トナー 3 C | 実施用トナー 1 に同じ | | | 70 | 0 | 4.0 | 20 | 22 | ○ |
| | トナー 3 K | 実施用トナー 1 に同じ | | | 70 | 0 | 4.0 | 20 | 22 | ○ |

[0094] [The example of developer manufacture]

(Manufacturing method of a carrier) It produced by the same method as an example 1, and the presentation.

[0095] (Developer manufacturing method) It produced by the same method as an example 1, and the presentation.

[0096] <<toner and developer evaluation>> The toner and developer which were produced by the above-mentioned method tested with the system, after evaluating evaluation of the float of an external additive, turbidity evaluation of an isolation external additive, and the electrification standup of a developer, respectively.

[0097] <<system evaluation>> The same device as an example 1 was used.

[0098] <<evaluation-criteria and method>> In the N.N. environmental condition (20 degree-C;50%R.H.), the system test performed 10000 on-the-spot photo evaluation, and carried out evaluation of the amount of electrifications after the first stage and 10000-sheet copy, a firefly, and black Poti.

[0099] (1) 60g of toners produced as shown in a table 1 was used using the powder circuit tester by external additive float Hosokawa Micron CORP., and the number of the external additive particle which can be checked with the naked eye which performed the tapping test and floated in the surface was counted and evaluated.

[0100] (2) Using COH[by turbidity Nippon Denshoku Co., Ltd.]-300A, toner 0.4mg and 1ml of water were put into the cel with a thickness of 1cm, and turbidity (a luminous diffuse transmittance / total transmittance x100) was measured. It is desirable that it is 20% or less practically.

[0101] (3) During mixing indicated by the developer electrification standup above-mentioned developer manufacturing method, the ratio for 1 minute after mixed initiation and 20 minutes was taken, and the electrification standup engine performance was evaluated. It is desirable that it is 0.75 or less.

[0102] The amount system of system test (4) electrifications performed the torture test, and the amount of electrifications of an early developer and the amount of electrifications at the time of 10000 copy termination were measured by the blowing off method.

[0103] (5) From the firefly image sample, the image defect of the shape of a firefly light by the toner aggregate was evaluated.

[0104] (6) The image defect of black Poti under the effect of the aggregate of the isolation external additive generated on a black Poti photo conductor was evaluated.

[0105] <<evaluation result>> It carried out by producing a developer with each toner which showed the above-mentioned evaluation in tables 4 and 5. The result is shown in tables 6 and 7.

[0106]

[A table 6]

| | Developer | Toner | Floating toner (number) | Charging amount (25# 2 μ c/g) | | Electrification standup (value of 1min /20mn) | Turbidity | Image defect of the shape (number of copy) | Occurrence of black spot (number of copy) |
|-------------|---------------|----------|-------------------------|-----------------------------------|---------------------------|---|-----------|--|---|
| | | | | Initial (μ C/g) | 10000 copies (μ C/g) | | | | |
| Example 2-1 | Developer 2-1 | Toner 1Y | — | 25 | 24 | 0.8 | 11 | — | — |
| | | Toner 1M | — | 25 | 24 | 0.8 | 11 | — | — |
| | | Toner 1C | — | 25 | 24 | 0.8 | 11 | — | — |
| | | Toner 1K | — | 25 | 24 | 0.8 | 11 | — | — |
| Example 2-2 | Developer 2-2 | Toner 2Y | — | 26 | 24 | 0.75 | 13 | — | — |
| | | Toner 2M | — | 26 | 24 | 0.75 | 13 | — | — |
| | | Toner 2C | — | 26 | 24 | 0.75 | 13 | — | — |
| | | Toner 2K | — | 26 | 24 | 0.75 | 13 | — | — |
| Example 2-3 | Developer 2-3 | Toner 3Y | — | 25 | 26 | 0.8 | 13 | — | — |
| | | Toner 3M | — | 25 | 26 | 0.8 | 13 | — | — |
| | | Toner 3C | — | 25 | 26 | 0.8 | 13 | — | — |
| | | Toner 3K | — | 25 | 26 | 0.8 | 13 | — | — |
| Example 2-4 | Developer 2-4 | Toner 4Y | — | 24 | 24 | 0.75 | 14 | — | — |
| | | Toner 4M | — | 24 | 24 | 0.75 | 14 | — | — |
| | | Toner 4C | — | 24 | 24 | 0.75 | 14 | — | — |
| | | Toner 4K | — | 24 | 24 | 0.75 | 14 | — | — |
| Example 2-5 | Developer 2-5 | Toner 5Y | — | 24 | 25 | 0.85 | 12 | — | — |
| | | Toner 5M | — | 24 | 25 | 0.85 | 12 | — | — |
| | | Toner 5C | — | 24 | 25 | 0.85 | 12 | — | — |
| | | Toner 5K | — | 24 | 25 | 0.85 | 12 | — | — |
| Example 2-6 | Developer 2-6 | Toner 6Y | — | 25 | 25 | 0.8 | 10 | — | — |
| | | Toner 6M | — | 25 | 25 | 0.8 | 10 | — | — |
| | | Toner 6C | — | 25 | 25 | 0.8 | 10 | — | — |
| | | Toner 6K | — | 25 | 25 | 0.8 | 10 | — | — |

[0107]

[A table 7]

| | 評価現像剤 | 評価トナー | 浮き評価 (個) | 帯電量 (25#2 μ C/g) | | 帯電立上り 1分値/20分値 | 濁度 | ホタル発生 コピー数 | 黒ポチ発生 コピー数 |
|------------|-------------------|-----------|-------------|-------------------------|--------------------------|-------------------|----|---------------|---------------|
| | | | | 初期 (μ C/g) | 10000コピー (μ C/g) | | | | |
| 実施例 2-7 | 現像剤 2-7 | 実施用トナー-7Y | 15 | 23 | 26 | 0.7 | 20 | - | - |
| | | 実施用トナー-7M | 21 | 23 | 26 | 0.7 | 20 | - | - |
| | | 実施用トナー-7C | 24 | 23 | 26 | 0.7 | 20 | - | - |
| | | 実施用トナー-7K | 30 | 23 | 26 | 0.7 | 20 | - | - |
| 実施例 2-8 | 現像剤 2-8 | 実施用トナー-8Y | - | 25 | 18 | 0.7 | 10 | - | - |
| | | 実施用トナー-8M | - | 25 | 18 | 0.7 | 10 | - | - |
| | | 実施用トナー-8C | - | 25 | 18 | 0.7 | 10 | - | - |
| | | 実施用トナー-8K | - | 25 | 18 | 0.7 | 10 | - | - |
| 比較用 2-1 | 比較用 現像剤 2-1 | 比較用トナー-1Y | 212 | 21 | 28 | 0.4 | 33 | 10 | 50 |
| | | 比較用トナー-1M | 223 | 21 | 28 | 0.4 | 33 | 10 | 50 |
| | | 比較用トナー-1C | 201 | 21 | 28 | 0.4 | 33 | 10 | 50 |
| | | 比較用トナー-1K | 182 | 21 | 28 | 0.4 | 33 | 10 | 50 |
| 比較用 2-2 | 比較用 現像剤 2-2 | 比較用トナー-2Y | - | 25 | 18 | 0.9 | 13 | 22 | - |
| | | 比較用トナー-2M | - | 25 | 18 | 0.9 | 13 | 22 | - |
| | | 比較用トナー-2C | - | 25 | 18 | 0.9 | 13 | 22 | - |
| | | 比較用トナー-2K | - | 25 | 18 | 0.9 | 13 | 22 | - |
| 比較用 2-3 | 比較用 現像剤 2-3 | 比較用トナー-3Y | - | 25 | 19 | 0.8 | 31 | - | 550 |
| | | 比較用トナー-3M | - | 25 | 19 | 0.8 | 31 | - | 550 |
| | | 比較用トナー-3C | - | 25 | 19 | 0.8 | 31 | - | 550 |
| | | 比較用トナー-3K | - | 25 | 19 | 0.8 | 31 | - | 550 |

[0108]

[Effect of the Invention] Since it is processing in the T_g-20 degree- $C \leq$ fixed processing temperature $\leq T_g+20$ degree C temperature requirement when a coloring particle and a particle are mixed under existence of mixed data medium and glass transition temperature (degree C) of the coloring particle at the time of mixing is set to T_g in this invention, According to the dispersion effect of data medium, neither the welding of a coloring particle nor condensation takes place, but distribution of uniform immobilization and an addition particle can be attained, and, moreover, mixing and immobilization are attained for a short time.

Moreover, the impulse force given from data medium is minute as compared with the fixed equipment of other types, and the soft target immobilization is attained.

[0109] In the preliminary mixing production process of the coloring particle and particle by another mode of this invention, it is the large conditions of the mechanical shock force, and when glass transition temperature (degree C) of the resin of a coloring particle is set to T_g , churning mixing is carried out in the range of the material temperature of preliminary mixing temperature $\leq T_g - 30$ degree C. Thereby, since the mixture in the condition of having distributed the external additive particle precisely on the surface of a coloring particle, and having adhered to homogeneity can be obtained in a short time, the float and isolation external additive of a particle are not generated and generating of black Poti is not accepted, either.

[0110] And in a fixed production process, the mechanical shock force is reduced from a preliminary mixing production process, and since material temperature is made high and processed at $T_g - 20$ degree-C \leq fixed temperature $\leq T_g + 20$ degree C, it can fix softly easily, without separating the particle which adhered suitable for the surface of a coloring particle, even if it does not especially use mixed data medium etc. Generating of the aggregate of a coloring particle or a welding object is not observed, either, and image defects, such as a firefly, are not accepted, either. Moreover, holding in the range of $1\text{min} \leq$ holding-time $\leq 60\text{min}$ at fixed temperature, and since temperature-of-goods adjustment is performed in the speed range of $1.0\text{-degree-C} / \text{min} \leq$ temperature up, and temperature fall ≤ 5.0 degrees C / , and min, it is still more possible to be able to attain a very uniform fixed condition and to obtain the stabilization over the long period of time of the amount of electrifications and the developer which was very excellent in the electrification standup.

[0111] By this, continue at a long period of time and the stable electrification nature and the imprint nature stabilized highly are maintained. Moreover, in order to realize image concentration continued and stabilized at the long period of time in the multiplex development aiming at not causing a miniaturization and color gap of equipment, and a package imprint process and to realize the stable imprint property The toner for electrostatic-charge image development which fixed the external additive in homogeneity on the surface of a coloring resin particle at software was obtained.

[Translation done.]